

April 14, 2008

MEMORANDUM

TO: Dan Redline, Regional Administrator, Coeur d'Alene
Roger Tinkey, Engineering manager, Coeur d'Alene

FROM: Gary Gaffney

SUBJECT: Staff Analysis for the Silverwood Theme Park Reuse Permit, LA-000217-01

PURPOSE

The purpose of this memorandum is to satisfy the requirements for issuing a wastewater reuse permit by preparing a staff analysis as outlined in the Application Processing Procedure in the Rules for Reclamation and Reuse of Municipal and Industrial Wastewater (IDAPA 58.01.17.400). The staff analysis must briefly state the principal facts and the significant issues considered in preparing the draft permit conditions and include a summary of the basis for the draft conditions with references to applicable requirements and supporting materials.

History:

Silverwood Theme Park is located on 379-acres in a rural setting about 16 miles north of Coeur d'Alene, 4 miles south of Athol, and northwest of the Highway 95 and Brunner Road intersection. The proposed wastewater treatment site is located on a 95-acre parcel adjoining the theme park property and southwest of the Highway 95 and Brunner Road intersection. The Final Design Report dated May 31, 2007 by James Coleman, P.E. indicated both of these properties are owned by Gary Norton as Norton Aero Ltd. A condition of the draft permit is that evidence be provided that Norton Aero Ltd had transferred ownership of both properties to Gary Norton as Silverwood Inc. (See Condition #1 below) Silverwood Inc., as the legal owner of the Silverwood Theme Park, will own, operate, and maintain the new wastewater system and is the responsible entity identified in the wastewater reuse permit.

The Silverwood Theme Park (<http://www.silverwoodthemepark.com/>) operates from about May 1st to September 30th for up to 150 days each year with an annual attendance of about 500,000 individuals. The facility first opened in 1989 using existing subsurface sewage systems and gradually grew over the years to its present configuration. During this time new wastewater systems for new park features involved septic tanks and subsurface drainfields were permitted one-by-one by the Panhandle Health District (PHD). In 2003, a large expansion project to construct a water slide park was submitted to DEQ for water and sewer approvals. Review revealed that the PHD had unknowingly issued subsurface sewage permits in the past for park expansions without attention to design requirements for a large soil absorption systems (LSAS) as specified in the Individual/Subsurface Sewage Disposal Rules (IDAPA 58.01.03). Ultimately, the park was operating twelve separate subsurface sewage systems discharging an estimated 4.5 million gallons of wastewater annually. Due to the high permeability of the soils and seasonal use, surfacing of wastewater at the various drainfields had not been detected. It was accepted that Silverwood's sewage disposal systems posed a potential risk of groundwater contamination. In addition, some of the existing systems had deteriorated and needed to be upgraded.

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In 2003 an agreement was reached with the park owner, Gary Norton, that DEQ would approve the pending LSAS for the water slide project (Boulder beach) if the owner would undertake efforts to bring the park's wastewater systems into compliance with applicable wastewater and water quality rules. A written commitment was issued by Silverwood to DEQ on April 9, 2003 agreeing to this arrangement. At that time, it was understood the wastewater system would be upgraded before the next park expansion was started. During the next three years, the owner attempted but did not complete an acceptable master plan for or design of wastewater system improvements. The delays were attributed to difficulty in securing engineering services.

Consent Order: In early 2007 DEQ discovered that Silverwood Inc. had embarked on another park expansion project involving improvements to the Boulder Beach area. Since this was done without the owner fulfilling the 2003 commitment to complete wastewater system upgrades prior to the next park expansion, DEQ initiated enforcement action. The problem was resolved when the owner retained the services of Coleman Engineering and entering into a Consent Order with DEQ that was executed on June 11, 2007. The goal of the Consent Order was completion of a new wastewater system that replaces the existing subsurface sewage systems before the park opened for business on May 1, 2008. Compliance steps are included in the Consent Order to give DEQ assurance Silverwood is progressing in good faith towards the goal. In recent weeks, the deadlines in the Consent Order have been modified reflecting construction delays. Nevertheless, an operational new wastewater system is still on schedule for completion during early summer of 2008.

Influencing the effort to replace the subsurface sewage systems at Silverwood are DEQ concerns about impact on ground water quality of the estimated 4.5 million gallons of sewage annually disposed at the facility. The site is located adjacent to the regulatory boundary of the Spokane Valley – Rathdrum Prairie Aquifer which has been designated as a Sensitive Resource Aquifer by the Idaho Ground Water Quality Rule. This designation requires that no activity be allowed or approved which has the potential to adversely impact the existing ground water quality. Although the 379-acres containing the theme park have been suggested by the design engineer as overlying an area with no ground water present above the bedrock, existing drinking water supply wells east of the park and two test wells completed in 2007 near the proposed wastewater treatment lagoons indicate that the site may contribute recharge into the Spokane Valley – Rathdrum Prairie Aquifer. Efforts to adequately describe ground water conditions and establish a ground water monitoring plan are ongoing and will be included as a compliance item in the draft permit. (See Condition #2 below)

Design: In June of 2007 DEQ approved a final design report prepared by Coleman Engineering for the proposed wastewater improvements. The new wastewater system included a new gravity sewage collection main extending through the park that will replace all but one small capacity and remote septic system. The new wastewater treatment system is located in the middle of a 95-acre parcel south of the park and will consist of four completely-mixed aerated lagoons designed to handle up to 100,000 gallons per day (gpd). The existing park produces an average of 35,000 gpd with peak days of about 45,000 gpd. Following lagoon treatment, the design calls for wastewater coagulation using polymer addition and a mixing chamber, filtration using a moving bed up-flow sand filter, hypochlorination disinfection dosed to a minimum of 1.0 mg/l, 30-minutes of chlorine contact in an oversized pipeline, and irrigation reuse. The irrigation system will initially use an approximately 10-acre field near the treatment lagoons called the Primary Area and approximately 8-acres of landscaped area at Boulder Beach within the theme park.

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Wastewater treatment was proposed to achieve Class B wastewater reuse standards (turbidity <2 NTU, total coliform < 2.2/100 ml; and free chlorine > 1 mg/l). In the event the treatment processes cannot meet Class B standards for the Boulder Beach applications, the permit allows spray irrigation application to the Primary Area if the wastewater complies with Class C standards.

Construction: At the end of July 2007, construction plans and specifications for the sewage collection and lagoon treatment systems were submitted. DEQ approved these construction plans and specifications on September 29, 2007. Silverwood provided notice that contractor selection, engineering inspection, and start of construction was in place prior to October 1st. On November 28, 2007 Silverwood provided notice to DEQ that construction was underway and on schedule for completion by April 1, 2008 with new system startup prior to the May 1, 2008 opening day. On January 4, 2008 DEQ approved revised plans and specifications reflecting addition of a chlorine contact pipeline and electrical drawings and established revised Consent Order compliance dates. On January 15, 2008 DEQ observed that construction was continuing on the wastewater mains, lagoons, and treatment building. As of the date of this memorandum, the design engineer needs to submit for DEQ approval plans and specifications for additional coagulation and filtration related equipment to be installed in the filtration building per Sheet 11 of the approved drawings. See Condition # 3 below.

On March 18, 2008 Silverwood petitioned DEQ for additional time to complete the improvements due to weather delays experienced during winter conditions. On April 1, 2008 DEQ accepted these changes. Delivery of wastewater from the park to the new treatment lagoons was changed to May 1, 2008 to coincide with opening of the park and opening of Boulder Beach was changed to June 7, 2008.

Class B Wastewater: The Final Design Report selected a moving bed up-flow sand filter as the mechanism to be used to achieve Class B wastewater standards. The drawings call out use of two filter units manufactured by Centra-Flo, Inc. and capable of a total flow up to 120 gpm. This type of filter was approved on March 23, 2006 by DEQ for application with systems needing Class A treatment. Installation by Blue Water Technologies has been approved by DEQ for two model CF-7 filters located inside the filter building. These filters have 12 ft.² of filter cross-section loaded at a maximum rate of 5 gpm/ ft.². As required in the reuse rules (IDAPA 58.01.17.600.07b) for Class B wastewater, the draft reuse permit will allow this new Class B system to be installed and tested by Blue Waters Technologies as a full-scale pilot during the first year of operation. (See Condition #4 below). Delays in opening the facility have now extended the pilot testing period until the end of the second operating season with a summary report being required before October 1, 2009.

Wastewater Reuse: Class B wastewater will be disinfected in the filter building and then flow through 200-feet of 24-inch diameter chlorine contact pipeline that discharges into the reuse pump station supplying a 4-inch diameter purple-pipe force main. The wastewater will either be diverted to the nearby 10-acre primary irrigation site or continued further to the Boulder Beach irrigation site.

The primary irrigation system will involve a 4-inch diameter aluminum header line with a tee and valve every 50 feet to one of ten 2-inch diameter portable surface laid irrigation laterals. These laterals will extend about 700 feet with impact sprinkler heads installed every 50 feet. The gross irrigation area in this 500 foot by 700-foot area is 8 acres. There is no direct public access to this site. There are no inhabited dwellings located within 300 feet of this site. The buffer distances for the Primary Area appear acceptable for Class C reuse.

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The other reuse site at Boulder Beach is supplied by extension of same 4-inch purple-pipeline. Details and approval of construction plans and specifications for the Class B Boulder Beach irrigation system have not been secured yet from DEQ. The engineering report had discussed a proposal is to discharge this wastewater into a new 200,000-gallon irrigation storage basin near the Boulder Beach water treatment backwash tank. This storage tank would supply two 10-Hp irrigation pumps each capable of delivering 150 gpm into a new purple-pipe irrigation system. Another proposal calls for discharging the Class B wastewater into an existing irrigation storage pond that would need to have a liner installed. Since Class B wastewater monitoring extends to the point of application, additional details regarding this part of the irrigation system are required. (See Condition #5 below)

The Boulder Beach irrigation system will not be connected in any direct way to the park's drinking water system. Any supplemental water would be discharged from the drinking water system into the Class B irrigation pond or tank via an air gap. Watering of the 8-acres of landscaped area will be accomplished during a 6-hour irrigation period when the park is closed.

Site Characteristics: The soils throughout this area consist of Avonville and Bonner gravelly silt loams. The Primary Area is generally flat and has not been actively cultivated for many years. The site is covered with knapweed which is a noxious weed regulated by the Kootenai County Noxious Weed Control office (446-1290). The field will need to be tilled and seeded with a properly selected grass species mix before the wastewater is land applied in accordance with a cropping plan. (See Condition #6 below) The Boulder Beach irrigation area has similar soil conditions but is presently landscaped. The Cropping Plan will need to include the Boulder Beach area although there is no need to prepare this area for irrigation except to install the purple irrigation distribution system.

Projected Wastewater Quality and Loading Rates: The Final Design Report estimated average Class B wastewater characteristics of BOD₅ at 3 mg/l; TSS of 2 mg/l; Total Nitrogen of 10 mg/l; Total Phosphorus of 1 mg/l and TDS at 250 mg/l. Based on a design flow of 35,000 gpd, this will result in constituent loading rates for total nitrogen of 87.5 #/acre/year and total phosphorus of 8.8#/acre/yr. which are well below the crop uptake rates for both constituents. Because the soils are free-draining, neither application site is expected to be limited in the amount of wastewater applied due to hydraulic limitations. The amount of applied wastewater available for irrigation will not fully satisfy the irrigation needs of the sites. Drought resistant plants in the Primary Area and supplement water in the Boulder Beach area will accommodate these shortfalls.

Loading rates to both areas are projected in the Final Design Report from 18 to 22-inches per year rate applied at an agronomic rate matching the evapotranspiration rates of the vegetation. Figure 6 of the Final Design Report suggests the following monthly maximum agronomic irrigation rates:

<u>Month</u>	<u>Agro. Rate (max.)</u>
May	1.5-inches
June	3.5-inches
July	7.0-inches
August	5.5-inches
<u>Sept.</u>	<u>3.5-inches</u>
Total =	21-inches

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As suggested by the design engineer, the application rates will be adjusted by the system operator based on equipment that monitors soil moisture. See Compliance Item # 3. The draft reuse permit may propose application rates as indicated above but applied to not exceed the evapotranspiration rate of the crop based on soil monitoring. At 21-inches per year and a design flow of 35,000 gpd, the system will need to irrigate a little more than 9 acres.

Since soil moisture monitoring is technically difficult to directly relate to agronomic rates and overly complicates system operations, DEQ may propose simplifying the application rates. If application is maintained at less than half of the estimated agronomic rates (under 15-inches per year), then soil moisture monitoring may be avoided.

Buffer Zones: The reuse rules allow Class B wastewater application in areas with direct public access but restricted to periods of non-use by the public. Application of wastewater to 8-acres of landscape areas at the Boulder Beach area of the park will be done after the park is closed for business. Delivery to the Boulder Beach irrigation system of wastewater not meeting Class B standards will not be allowed.

Application of wastewater to the 5-10 acre primary area near the wastewater treatment facility involves no public access with more than 300 feet to the nearest inhabited dwelling. This satisfies the buffer distance requirements for Class B or C wastewater allowing this area to be utilized for land application in the event the treated wastewater fails to meet Class B standards but satisfies Class C standards. Fencing of the Primary Area will be required if it receives Class C wastewater beyond the pilot period.

Groundwater Monitoring: Figure 4 in the Final Design Report shows the location and information on wells in the vicinity of Silverwood. The well data shows some wells encountering no or limited ground water above the granite bedrock and other wells (such as Silverwood's drinking water supply wells) encountering a robust supply of ground water. The data suggests there is a "ground water channel" crossing the site consisting of some type of discrete underground area that conveys ground water.

In July and August of 2007 Silverwood Inc. drilled two test wells in the vicinity of the treatment site. The IDWR Well Driller's Reports for the first test well (#D0051778) located near the wastewater treatment lagoons showed sands and gravels present to 398 feet below ground surface (bgs), static water at 294 feet bgs, and yield at 100+ gpm. The Well Driller's Report for the second test well (#D0053839) located north of the power lines and treatment lagoons reported similar subsurface materials as the first test well, was completed to 318 feet bgs, had static water to 305 feet bgs, and yield at 25+ gpm.

The draft permit will ask the design engineer to use information from the test wells to develop a ground water model and propose a ground water network monitoring plan for inclusion in the final reuse permit. See Condition #2 below. As a minimum, some type of down-gradient ground water monitoring will be required.

Monitoring:

Flow: Wastewater is collected into gravity sewer service lines throughout the park and gravity flows into the treatment lagoons. A trapezoidal flume and ultrasonic level sensor will be installed to record daily inflow. A flow meter on the irrigation pump station will record the amount of wastewater pumped for irrigation.

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Abandonment of the septic tanks, effluent pump stations, and drainfields replaced by the new wastewater collection system after startup of the new system will need to be documented with the Panhandle Health District. (See Condition #7 below)

Turbidity: A recording turbidimeter will be installed in the filter building at the treatment site to ensure the wastewater meets the less than 2 NTU standard based on the daily arithmetic mean of continuous measurements. Automatic shutdown of the irrigation pump station or diversion of the wastewater to the Primary Area for application per Class C standards needs to be provided if any instantaneous turbidity reading exceeds 5 NTU.

Disinfection: The design calls for disinfection of the filtered wastewater using a hypochlorination system in the filter building. At least 30 minutes of chlorine contact will be made available after filtration and chlorine addition prior to the irrigation pump station by installation of 200 feet of 24-inch diameter contact pipeline. Based on a maximum filtration rate of 120 gpm, this contact pipeline should provide about 39 minutes of contact time prior to the reuse pump station which appears to satisfy the required 30 minutes of minimum chlorine contact prior to irrigation. There are over 4500 feet of 4-inch diameter force main providing chlorine contact between the reuse pumping station at the treatment site and the Boulder Beach irrigation site.

Chlorine Residual: The Final Design Report has proposed installation of a continuous free chlorine residual monitor. This monitoring unit needs to automatically discontinue the irrigation pump and autodial the operator if the free chlorine falls below the 1.0 mg/l minimum.

At the beginning of each daily irrigation session and periodically afterwards, the operator will be required to ensure the free chlorine residual is no less than 1.0 mg/l at the point of compliance. If the chlorine concentration is below the required 1.0 mg/l minimum in wastewater going to the Boulder Beach irrigation storage tank/lagoon, the operator will need to stop the irrigation pumping and adjust the chlorination rate until the chlorine achieves compliance. During the adjustment, wastewater could be diverted to the Primary Area and applied in accordance with Class C wastewater standards.

Bacteriological Quality: On a daily basis whenever irrigating, the operator is required to sample the applied wastewater for total coliform (TC) bacteria. Compliance with Class B bacteria standards will require TC median numbers of less than 2.2 organisms/100 ml. based on the last seven days of sampling with no single result exceeding 23 organisms/100 ml. Wastewater failing to meet Class B bacteria standards might be applied to the Primary Area if the wastewater based on daily sampling complies with TC requirements for Class C of less than 23 organisms/100 ml.

Nutrient Loading: The Final Design Report has proposed weekly composite sampling for total nitrogen, nitrate nitrogen, BOD5, and total phosphorus whenever wastewater is being applied for irrigation.

Standby Power: In the event of a power outage, the sewage will continue to flow by gravity into the treatment lagoons where there is sufficient storage capacity available to accommodate a significant period of power outage. In addition, without power available the park will close reducing wastewater flow. There appears to be no need for this wastewater treatment and reuse system to install standby power.

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Operator Licensure: Blue Water Technologies (<http://www.blueh2o.net/default.aspx>) has been identified as providing operator services for the new Silverwood Class B wastewater system for at least the first year and perhaps on a contract basis for the future. An initial system classification suggests this system will need the services of a Class I collection, Class III treatment, and Land Application licensed operators. Blue Water Technologies will need to identify the specific individuals responsible for this facility. The Reuse Permit will include a requirement that the owner secure the services of appropriately licensed wastewater operators. (See Condition #8 below)

Special Conditions: The following special conditions will be included in the final draft permit unless Silverwood resolves a condition during the draft permit comment period:

1. Ownership: Evidence is provided prior to July 1, 2008 in the form of a copy of the deed that title to the 95-acre wastewater treatment site described as Kootenai County parcel number 53N03W-33-0750 has been transferred to Silverwood Inc.
2. Ground Water Monitoring Network Plan: Information reflecting ground water conditions at the two land application sites updated to reflect test well drilling in 2007 including a proposal regarding ground water monitoring network is required prior to September 1, 2008.
3. Coagulation, Filtration, and Disinfection Equipment: Before June 1, 2008, details regarding the proposed polymer feed and mixing chamber, disinfection feed pump and chlorine solution tank, continuous turbidimeter and recording equipment, chlorine residual analyzer, effluent pump specifications and details, irrigation pump specifications and details, soil moisture monitoring equipment, system controls, and all other equipment or piping needs in the filter building must be approved by DEQ. This information includes the "Equipment Skid by Blue Water Technology" located in the filter building on the approved Sheet 11 of the plans and specifications dated October 12, 2007.
4. Pilot Testing Plan: Prior to reuse system startup, a pilot testing plan must be submitted to DEQ for the Class B treatment system as required by the wastewater reuse rules. The plan needs to detail routine monitoring efforts, performance testing, and frequencies. This data needs to be submitted to DEQ by the design engineer on October 1, 2009 demonstrating reliable Class B performance. If Class B performance cannot be achieved or documented, this submittal will need to propose treatment modifications and/or another pilot testing period.
5. Boulder Beach Reuse System: Prior to Boulder Beach startup on June 1, 2008, plans and specifications prepared by the design engineer for construction of the Class B wastewater irrigation system to be installed to irrigate the Boulder Beach area must be approved by DEQ. Upon completion, record drawings for this same irrigation system certified by the inspecting engineer must be submitted to DEQ.
6. Primary Area Cropping Plan: Before May 1, 2008, a detailed cropping plan must be developed and submitted to DEQ for establishing plants and vegetation in the primary irrigation area appropriate for wastewater reuse applications. Currently this area has not been actively farmed for the last 15 years and consists of weeds and other vegetation that need to be replaced with plants and vegetation that will improve nutrient and hydraulic uptake of the wastewater.

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7. Notice of Abandonment: Prior to June 1, 2008, the design engineer must provide the Panhandle Health District and DEQ with information required by the Individual and Subsurface Sewage Disposal Rules (IDAPA 58.01.03) that all of the septic tanks and drainfields replaced by this project at Silverwood had been properly abandoned.
8. Operator Licensure: Prior to May 1, 2008, a copy of the contract between Silverwood Inc. and Blue Waters Technologies for operation of the new Class B wastewater system serving Silverwood needs to be submitted to DEQ. This submittal needs to document the names and licensure classes of the primary and backup system operators that are consistent with the established licensure needs of the system. Initial evaluation suggests this system is required by the Idaho Wastewater Rules (IDAPA 58.01.16) to have operators with Class I collection, Class III treatment, and Land Application licenses.

RECOMMENDATION: The Staff Analysis and draft Reuse Permit for Silverwood Inc. are recommended for distribution to the permittee and others for a 30-day comment period. Once comments are resolved, a final permit can be executed by DEQ.

cc: Olga Cuzmanov, DEQ Wastewater Program, Boise State Office
Richard Huddleston, State Water Quality Office, Boise State Office
Wastewater Reuse File No. LA-000217-01